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(54) SECURING TOGETHER METAL COMPONENTS

(71) We, TUBE MANIPULATIONS LIMITED, of Gainsford Drive, Halesowen Industrial Park, Halesowen, West Midlands B62 9HN, a British Company, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the securing together of plate-like metal components to produce a fabrication in which the components have apertures in registry. The invention is particularly but not necessarily exclusively applicable to the attachment of gas-tap mounting plates to metal section gas rails, the mounting plates having apertures which register with respective apertures in a wall of the gas rail to form a gas-supply connection between the gas tap and the gas rail.

Our prior Patent No. 1 430 160 discloses one method in which the mounting plates are attached to the wall of the gas rail by projection welding. This method entails using a plate formed with an annular projection surrounding an aperture in the plate and a corresponding aperture has to be formed, in a separate operation, in the gas rail wall.

The object of the invention is to provide a method of securing together plate-like metal components in which registering apertures are formed in the components during the step of forming a bond between the components.

According to the present invention we provide a method of securing together at least two plate-like metal components in which a hole is formed in the components by flow-drilling while the components are held together in face-to-face contact, the plastic flow of metal created by the flow-drilling being effective to produce a bond between the components.

Flow-drilling is a known technique of forming holes in components by means of a heavy, high-speed drilling-like operation in which the metal is placed in a plastic condition. For further details of this technique, reference should be made to the December 1975 issue of "Engineers' Digest" and the 5th November 1975 issue of "Machinery and production engineering". The present invention makes use of the metal plasticity condition resulting from the generation of frictional heat to face together the metal components in the region of the inter-face therebetween.

In practice, in fabrication of a gas rail each mounting plate is clamped in the desired position on a flat face of the gas rail metal section so that the components are in face-to-face contact and the flow-drilling operation is then performed to pierce a hole through the mounting plate and adjacent wall of the gas rail. At the same time, the bond between the two components is created. Preferably to provide a flat mounting surface for the gas tap, the flow-drilling is carried out by the flow-drilling tool to produce a flush finish. During the flow-drilling operation, the metal will also be forward extruded into the interior of the gas rail to form a bush as explained in the previously-mentioned reference. After completion of the flow-drilling operation, the resulting hole and bush may be tapped to provide a screw-threaded connection with the gas tap.

If desired, a pilot hole may be drilled through the components prior to flow-drilling operation.

The invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a diagrammatic view showing the bonding together of a pair of components with the simultaneous formation of a hole therein; and

Figure 2 is a perspective view of a gas rail assembly in which a saddle plate is secured to the gas rail by flow-drill welding.

5 In Figure 1, a pair of components 10, 12 are shown welded together around a hole formed therein by flow-drilling using the flow-drill tool 14. As shown, the hole is defined partly by material which has been forward-extruded during flow-drilling to form a collar 16. The bond between the two components is depicted diagrammatically by reference numeral 18.

Figure 2 shows a saddle plate 20 which has been flow-drill welded to the wall 22 of a square section gas rail, the flow-drilled hole being indicated by reference numeral 24. The laterally projecting ends of the saddle plate are also apertured at 20 26 for reception of suitable fasteners for securing a gas tap to the gas rail assembly with the tap flow passage in registry with the hole 24.

WHAT WE CLAIM IS:—

25 1. A method of securing together at least two plate-like metal components in which a hole is formed in the components by flow-drilling while the components are

held together in face-to-face contact, the plastic flow of metal created by the flow-drilling being effective to produce a bond between the components.

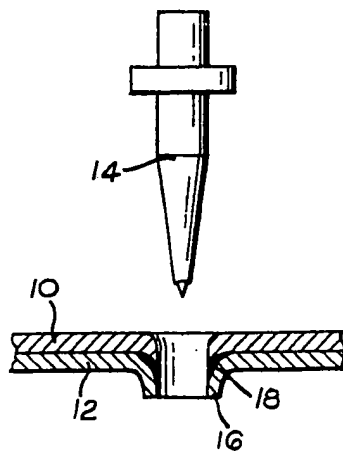
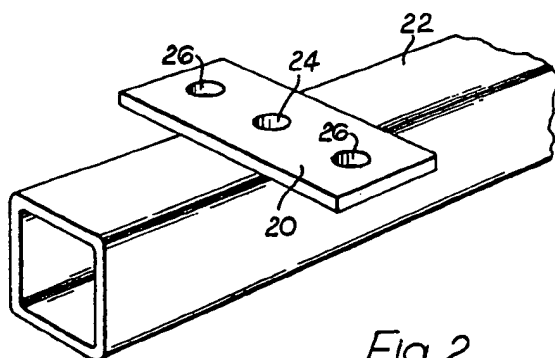
2. A method as claimed in Claim 1 in which the flow-drilling is adapted to remove the material back-extruded during the flow-drilling operation.

3. A method as claimed in Claim 1 or 2 in which the hole formed by flow-drilling is screw-tapped.

4. A method as claimed in any one of Claims 1-3 in which one of said components is a gas rail having a flat face and the other component constitutes a mounting saddle for a gas tap, the resulting flow-drilled hole providing communication between the interior of the gas rail and the gas tap.

5. A method as claimed in Claim 1 substantially as hereinbefore described with reference to the accompanying drawings.

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*Fig. 1.**Fig. 2.*